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Controlling drug release from mesoporous silica through an amorphous, nanoconfined 1-tetradecanol layer

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Abstract: Mesoporous silica materials are promising nano-carriers for drug delivery systems. Even though there are many strategies for controlling the drug release kinetics, these must be adapted through trial and error on a case-by-case basis. Here we explore the possibility of tailoring the release kinetics of hydrophilic, water soluble therapeutic agents from mesoporous silica through addition of a hydrophobic excipient, 1-tetradecanol. *In vitro* drug release experiments performed at 37 °C, in phosphate buffer solution (pH 7.4) show that the addition of tetradecanol yields slower drug release kinetics, which was correlated with the presence of a liquid fatty alcohol interfacial layer. The layer mass is 11-23 % wt. of the metoprolol-loaded silica sample, and it causes up to 1.6 times decrease of initial release rate with respect to materials without the fatty alcohol. This effect does not depend of carrier pore arrangement, being noticed for both hexagonal MCM-41 and cubic KIT-5 mesoporous silica. The toxicity of tetradecanol-containing materials was evaluated by formazan-based viability assay on Opossum kidney epithelial cell line, and no significant toxicity was observed.

Keywords: mesoporous silica, interfacial layer, controlled release, tetradecanol, drug delivery systems

1. Introduction

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